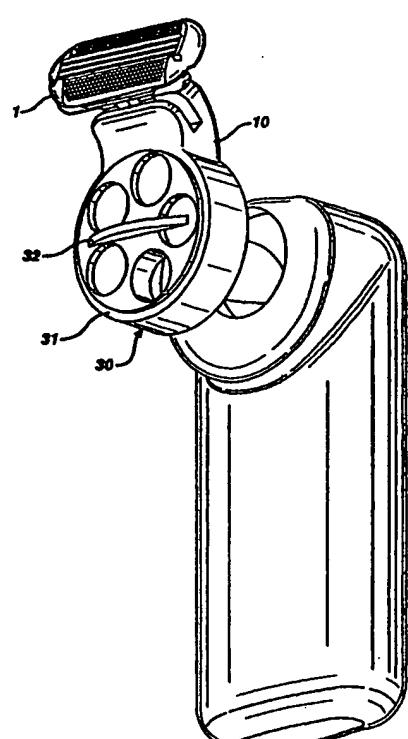


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<p>(54) Title: <b>APPLYING FLUID PREPARATIONS TO THE SKIN, E.G. IN CONNECTION WITH SHAVING</b></p> <p>(57) Abstract</p> <p>A safety razor has a handle formed by a refillable container (8). After filling with water a tablet (20) containing a carbon dioxide gas generating substance is added to the water and the gas pressure is used to deliver liquid from the container to the underside of the razor blade unit (1). The tablet also includes a substance which upon being mixed with water produces a fluid which may have desirable properties for application to the skin during shaving, such as lubrication, moisturising, applying a fragrance, chemical treatment of hairs, bacterial or medicinal treatment of the skin and/or blood coagulation. The container (8) can be equipped with a dispenser (30) operable to deliver tablets into the water filled container.</p> 			

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APPLYING FLUID PREPARATIONS TO THE SKIN,  
E.G. IN CONNECTION WITH SHAVING

This invention relates to the field of preparing fluids for application to the skin such as in connection with shaving and particularly so-called "wet shaving"

5    during the process of which a razor with one or more sharpened cutting edges is moved over the skin to sever hairs projecting from the skin. It is usual to apply to the skin a preparation, such as shaving soap, which can be applied by means of a brush, shaving foam, or shaving gel to improve the conditions for actual shaving.

10   The need to prepare the skin in this way as part of the overall shaving procedure is an inconvenience and adds significantly to the time required to complete a satisfactory shave.

With the foregoing drawbacks in mind, in accordance with an aspect of the present invention there is provided a method of preparing a fluid to be applied to the skin, for example in connection with a shaving procedure, comprising filling a 15    refillable reservoir with water and adding to the water a substance which generates gas and which produces said fluid upon mixing with water, sealing the reservoir after addition of the substance whereby the gas generated pressurizes the interior of the reservoir for delivering the fluid from the reservoir for application to the skin.

According to another aspect the invention provides a system for 20    preparing a fluid to be applied to the skin, e.g. in connection with a shaving procedure, comprising a refillable reservoir having at least one inlet and discharge port for filling the reservoir with water, for delivering into the reservoir a dose of a substance for mixture with water in the reservoir, and for discharging the liquid contents by pressure of gas within the reservoir, and a dose of substance for addition 25    to the water and which upon mixing with the water generates gas and produces a prepared fluid for application to the skin, the reservoir being arranged for the gas generated by the dose of substance being mixed with water therein to pressurize the reservoir and to deliver the prepared fluid through the discharge port for application of the skin.

30   It is possible for a single port to provide the three functions of filling the reservoir with water, introducing the dose of substance and discharging the prepared fluid, or one port can serve for two of these functions while a second port

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serves for performance of the third. Alternatively, respective ports could be provided for filling with water, adding the substance, and discharging the fluid contents.

A valve means may be provided in a fluid discharge passage in order to control delivery of the prepared fluid from the reservoir. Conveniently prepared 5 fluid is discharged by means of a dip tube extending into the reservoir and the dip tube can be equipped with a valve arrangement permitting discharge of the prepared fluid with the reservoir held either upright or in an inverted orientation.

The method and system for preparing a fluid according to the invention can be utilized advantageously in connection with a shaving procedure for 10 preparing a fluid and delivering the fluid to the skin prior to, during or subsequent to actual shaving. The invention is especially convenient for delivery of a fluid which is applied to the skin by means of the razor itself, and in accordance with a further aspect the invention provides a razor comprising a shaving head including at least one blade, and a reservoir for supplying fluid to be applied to the skin during shaving, 15 and a substance which on mixing with water generates a gas and produces the fluid to be applied to the skin, the reservoir being coupled to the shaving head and comprising a chamber refillable with water and at least one inlet and discharge port for filling the chamber with water, for delivering into the chamber the substance for mixing with water in the chamber to prepare the fluid to be applied to the skin, and 20 for discharging the prepared fluid from the chamber for application to the skin, the fluid being discharged at or adjacent the shaving head under pressure produced in the chamber by the gas generated when the substance is mixed with the water in the chamber.

There have been previous proposals to include a pressurized container 25 in a razor handle structure for dispensing shaving foam, examples of such constructions being those described in US 5337478, WO-A-97/18065 and EP-A-0505630. The containers used in these razors are of the type which are pressurized in the factory at the time of manufacture. There have also been proposed razors in which liquid is discharged from a reservoir under gravity during shaving, 30 examples of such razors being those described in US-A-4238882, US-A-4074429 and GB-A-2266854. In GB-A-690828 there is disclosed a razor with a refillable reservoir which is pressurized by a piston actuated by a spring or a manually operated air

pump and GB-A-2075406 describes a razor in which liquid is dispensed from a refillable container by operation of a fluid pump.

In a razor according to the present invention the fluid is preferably discharged at a position ahead of the blade or blades of the razor as they move across 5 the skin during shaving, such as at the position of the guard of the shaving head which is disposed in advance of the blade or blades.

It is preferable that the substance be introduced into the reservoir as a predetermined dose and according to yet another aspect of the invention there is provided a container for preparing fluid for application to the skin in the course of 10 performing a shaving procedure, comprising a refillable reservoir having an inlet for filling the reservoir with water, and a dispensing device for delivering a predetermined dose of substance into the water-filled reservoir, the dispensing device being arranged to hold a plurality of doses and being operable to deliver the doses into the reservoir in turn.

15 Such a container provides a very convenient way to prepare fluid for use during shaving, at the beginning of each shave the reservoir simply being refilled with water and the dispensing device being actuated to dispense the appropriate dose of substance into the water.

Most conveniently and preferably the substance is a solid and is 20 supplied in predetermined doses in tablet or capsule form. In this case the container dispensing device may incorporate a magazine which is adapted to hold several tablets and to dispense the tablets one at a time into the reservoir for mixture with liquid therein.

The substance can be chosen so that when mixed with water it will 25 produce a fluid which can have a desired effect when applied to the skin in the course of a shaving procedure or in association with a shaving procedure. Thus, the prepared fluid may for example have one or more of the following effects:

- (i) lubrication to help the razor slide over the skin;
- (ii) moisturizing and/or otherwise conditioning the skin;
- 30 (iii) adding a fragrance;
- (iv) chemically treating hairs to facilitate cutting;
- (v) bacterial or medicinal treatment of the skin;

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(vi) cleansing the skin; and

(vii) blood coagulation and/or other beneficial treatment of minor cuts and abrasions which can be suffered during shaving.

A gas generating substance can be included so that the substance, when 5 mixed with water, will effervesce. The gas which is generated is preferably inert and carbon dioxide is most preferred as it is harmless and can be easily produced. The gas generator could for example be sodium bicarbonate which generates carbon dioxide gas when dissolved in water. The generation of carbon dioxide can, however, be accelerated by a chemical reaction involving neutralization of a 10 carbonate salt by a weak acid, and the preferred gas generating substance is a mixture of dry solids comprising citric and/or tartaric acid with a carbonate salt including one or more selected from sodium carbonate, sodium bicarbonate, sodium hydrogen carbonate, potassium carbonate, potassium bicarbonate and potassium hydrogen carbonate. Other suitable gas generators will occur to those skilled in the art.

15 The substance which is mixed with water in the reservoir may be a solid substance, in which case it can conveniently be provided in tablet form, or as a powder contained within a soluble capsule. Alternatively, a substance other than a powder can be used and supplied, for example, within a soluble capsule or in a sealed sachet from which the substance is discharged into the reservoir.

20 A better understanding of the invention in its different aspects will be gained from the more detailed description which follows and in which reference is made to the accompanying drawings, wherein:

Figure 1 is a front view of a razor according to the invention;

Figure 2 is a side view of the razor shown in Figure 1;

25 Figure 3 shows the razor of Figure 1 from the rear;

Figure 4 is an enlarged underside view of the shaving head of the razor shown in Figure 1;

Figure 5 is a side view of the razor of Figure 1 with the reservoir container removed;

30 Figure 6 is an enlarged perspective view showing an upper part of the razor of Figure 1;

Figure 7 is a cross-section through the upper part of the razor of

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Figure 1;

Figure 7A is a sectioned perspective view showing a modification to the razor neck and cartridge of the embodiment illustrated in Figure 7;

Figures 8 and 9 are cross-sections illustrating the dip tube valve system  
5 in upright and inverted orientations, respectively;

Figure 10 is a front view showing a modified razor including a tablet  
dispenser;

Figure 11 is a side view of the razor of Figure 10; and

Figures 12 shows the razor of Figure 10 in perspective and which the  
10 upper part partially removed for filling the reservoir container with water.

Referring initially to Figures 1 to 7 there is shown a razor having a  
shaving head or blade unit 1 including three blades 2 with parallel cutting edges  
carried within a frame 3 which also supports guard and cap structures 4,5 defined by  
elastomeric strips which are each shown to have an array of close-packed cylindrical  
15 recesses 6, although other configurations of recesses and/or projections could be  
provided instead as known in the art. For further details of the elastomeric strips 4,5  
and the recesses 6 therein reference can be made to W096/02369, W097/17174, the  
contents of which are incorporated herein by reference. The cap structure 5 includes a  
lubricating strip 12 as known per se and which may be as described in US Patent No.  
20 5113585, the contents of which are incorporated herein by reference. The blades 2  
can be movable independently of each other against the action of return springs under  
the forces experienced by the blades during shaving as also known in the art. Further  
details of spring loaded blades may be found in US Patent No. 4492025 the contents  
of which are also incorporated herein by reference. Alternatively, the blades 2 can be  
25 fixedly mounted in the frame. The shaving head 1 may be fixedly attached to the  
remaining parts of the razor with the intention that at least the upper part of the razor  
be discarded in entirety when the blades 2 have become dulled, or the shaving head 1  
could be of the replaceable cartridge type so that the shaving head is merely replaced  
when the blades 2 have lost their sharpness.

30 The razor includes a refillable reservoir in the form of a container 8  
which doubles as the razor handle, this container having a generally flat rectangular  
form enclosing an interior chamber with an inlet/discharge port 7 defined by a neck 9

- 6 -

(Fig. 7) located at the upper end of the reservoir container and by means of which the container is detachably connected, such as by a screw threaded or bayonet type coupling, to a razor neck 10. A lower part of the razor neck 10 forms a cap for co-operation with the container neck 9, and the upper part of the razor neck carries 5 the shaving head 1. The razor neck 10 is equipped with an elongate dip tube 11 (Figs 5 and 7) which is arranged to extend down through the container neck 9 and substantially to the bottom of the container 8 when it is coupled to the razor neck 10. Further details of the dip tube are described below with reference to Figures 8 and 9. The upper end of the dip tube 11 communicates with a fluid delivery passage 13 10 which in the embodiment illustrated in Figure 7 is formed by a tube 14, but in the modified embodiment shown in Figure 7A a bore 17 through the razor neck 10 defines part of the fluid delivery passage. The downstream end of the delivery passage 13 is connected to an inlet duct 15 in the shaving head. The inlet duct 15 is formed in a manifold member 16 which is attached to the underside of the frame 3 of 15 the shaving head 1 and includes a socket 15a to which the end of the tube 14 is fitted and with which the duct 15 communicates. The manifold member 16 extends along the underside of the guard 4, parallel with the blades and adjacent the trailing edge of the guard surface, as can be seen in Figure 4. The delivery manifold 16 defines an interior channel 16a and has spaced along its length a series of holes which are 20 aligned with openings 18 in the guard surface. Thus, it will be understood that fluid in the container 1 can be delivered, by means of the dip tube 11, the delivery passage 13, the delivery manifold 16, and the openings 18 to the guard surface, it being the intention that such delivery should occur during the process of shaving with the razor. In the modified construction of Figure 7A, the delivery tube opens into one of the 25 recesses 6 of the guard strip 5 and in this case there is no manifold member, the tube 14 being connected to an opening in the guard structure.

At the beginning of a shaving procedure, the container 8 is disconnected from the razor neck 10 and is filled with water to a depth that may be indicated by an appropriate marking on the container. A tablet 20 (Fig. 5) of a solid 30 substance which on contact with water effervesces to generate gas, preferably carbon dioxide and with the water forms a fluid having a characteristic which makes it desirable for application to the skin during shaving, is dropped into the container 8

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through the neck 9, and the container is then immediately reconnected to the razor neck 10. The preferred gas generating substance comprises a mixture of tartaric acid and/or citric acid with a carbonate, bicarbonate or hydrogen carbonate salt of sodium or potassium. The gas generated by the reaction of the tablet substance with the 5 water causes the pressure within the ullage space above the water in the container to rise, and this pressure forces the prepared fluid produced by the solid substance mixing with the water to flow through the dip tube 11 and to the shaving head following the flow path previously described. The amounts of gas generated and fluid prepared are sufficient for continuous delivery to take place for the time taken 10 to complete a shave with the razor, although it will be appreciated that the amounts of carbon dioxide generating substance will depend on the volume of the container 8 and the amount of water it is intended to be filled with. In one test, however, a container having a capacity of 40ml was filled with 30ml of water. Two tablets each weighing 0.3g were added to the water, the composition of each tablet being:

15	Sodium hydrogen carbonate	44 wt%
	Citric Acid	36 wt%
	Xanthum Gum	15 wt%
	Polyox (lubricant)	5 wt%

20 The maximum pressure generated in the container which was fitted with a 5mm bore ball valve in the dip tube, was 0.6 psi (4.1kPa) and this pressure produced an average maximum flow rate of 4.5ml/min, and continuous flow of liquid from the container lasted for an average of about 7 minutes.

25 It will be understood the procedure of filling the container 8 and adding a tablet 20 will be repeated for each shave. If desired the delivery passage could be fitted with a valve to allow the user to control the time of delivery and/or the rate of delivery of prepared fluid to the shaving head 1.

30 As razors are sometimes held other than upright during shaving the dip tube 11 preferable incorporates a valve arrangement to ensure that prepared fluid is always discharged by the gas pressure. As shown in Figures 8 and 9, the dip tube 11 has openings 23, 23' adjacent its opposite ends for connecting the inside of the tube with the interior of the container, these openings being controlled by respective ball valves 24, 25. Each of the valves is gravity operated with the ball 24, 25 moving

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under its own weight between open and closed positions as the container is rotated between upright and inverted orientations. When the container is upright (Fig. 8) the lower valve 24 is open due to its ball having moved away from the valve seat 24a and the upper valve 25 is closed, due to its ball engaging the valve seat 25a and

5 being held against the seat by the pressure in the container. When the container is inverted (Fig. 9), the valve 25 is opened and the valve 24 is closed. Thus, in both orientations that dip tube opening 23 or 23' which is opened for flow of fluid into the dip tube 11 is always immersed in the fluid within the container 8.

In Figures 10-12 there is illustrated a modified razor which is generally

10 similar to that described above but differs in that the razor neck 10 incorporates a tablet magazine and dispenser 30. The shape of the container 8 is adapted to define a forwardly facing neck opening or port to which the lower part of the razor neck 10 is detachably connectable by any suitable means capable of establishing a sealed connection between the razor neck 10 and the container 8. The lower portion of the

15 razor neck 10 incorporates the tablet magazine and dispenser 30 which includes a cylindrical housing 31 within which there is received a rotary member 32 defining a series of pockets 34, five in number as shown, distributed in a circular array and intended to receive respective tablets of solid substance to be mixed with water within the container 8. A detent system is preferably provided to provide some

20 control over the rotation of the member 32 whereby the pockets 34 are easily presented in turn in position to dispense the tablets contained therein into the container interior. The tablet magazine can be rechargeable to allow the pockets to be refilled with tablets after they have been emptied, or the rotary member could be replaceable to allow an emptied member 32 to be replaced by a similar but fully

25 charged one. Alternatively, the magazine may be adapted to hold a sufficient number of tablets for a number of shaves that the blades of the razor are expected to last for before becoming dulled, and the magazine and razor cartridge may then be discarded and replaced together, possibly as a single unit or a cartridge and magazine assembly.

In use of the razor of Figs 10-12, the container 8 is detached from the

30 razor neck 10 and filled to a certain level with water, after which the container 8 and razor neck are reconnected. The rotary member 32 is then turned manually to bring a pocket 34 containing a tablet to a rotational dispensing position whereat the tablet 20

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is deposited from the pocket into the container where it mixes with the water for generating gas and producing a prepared fluid to be delivered to the shaving head 1. The fluid is conducted to the guard surface of the shaving head in the same way as described above with respect to the embodiment of Figures 1-9, namely through the

5 dip tube, the delivery passage included in the razor neck, the delivery manifold provided in the shaving head, and the openings 18 at the guard surface. It will be appreciated that the tablet magazine and dispenser is shown only schematically and it would be arranged so that the container is sealed closed after delivering a tablet into the container, which is necessary to create the gas pressure needed for discharging the

10 prepared fluid in the reservoir container.

Modifications are of course possible to the specific embodiments described above without departing from the scope of the invention as defined by the claims which follow. By way of example, a valve could be included in the fluid passage 13 between the container 8 and shaving head 1 to allow the user to control

15 when and/or the rate at which fluid is to be supplied to the shaving head. Also, a tablet system for preparing and dispensing a prepared fluid onto the skin in the course of a shaving procedure could be provided independently of a razor if desired. A container and supply of tablets can have the advantage of being much smaller and lighter in weight than conventional shave preparation dispensers.

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C L A I M S

1. A method of preparing a fluid to be applied to the skin, for example in connection with a shaving procedure, comprising filling a refillable reservoir with water and adding to the water a substance which generates gas and which produces said fluid upon mixing with water, the reservoir being sealed after addition of the substance whereby the gas generated pressurizes the interior of the reservoir, and using the gas pressure to deliver the fluid from the reservoir for application to the skin.
- 5 2. A method according to claim 1, wherein the substance is added to the water in the form of a tablet or contained in a water soluble capsule.
- 10 3. A method according to claim 1 or 2, wherein the fluid is delivered from the container to a shaving head for application to the skin.
- 15 4. A method according to claim 1, 2 or 3, wherein the substance is added to the water in a predetermined amount to produce sufficient prepared fluid for one complete shaving procedure.
5. A method according to claim 1, 2, 3 or 4, wherein substance added to the water generates carbon dioxide on mixing the water.
- 20 6. A method according to claim 5, wherein the substance comprises sodium bicarbonate.
7. A method according to claim 5, wherein the substance comprises tartaric acid and/or citric acid, and at least one salt selected from the group consisting of sodium carbonate, sodium bicarbonate, sodium hydrogen carbonate, potassium carbonate, potassium bicarbonate and potassium hydrogen carbonate.
- 25 8. A system for preparing a fluid to be applied to the skin, for example in connection with a shaving procedure, comprising a refillable reservoir having at least one inlet and discharge port for filling the reservoir with water, for delivering into the water filled reservoir a dose of a substance for mixture with water in the reservoir, and for discharging the liquid contents by pressure of gas within the reservoir, and a dose of substance for addition to the water and which upon mixing with the water generates gas and produces a prepared fluid for application to the skin, the reservoir being arranged for the gas generated by the dose of substance being mixed with water therein to pressurize the reservoir and to deliver the prepared fluid through the
- 30

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discharge port for application to the skin.

9. A system according to claim 8, including means for delivering a predetermined dose of substance into the container.
10. A system according to claim 8 or 9, including a dose of substance in 5 tablet form or contained in a water soluble capsule.
11. A system according to any one of claims 8, 9 or 10 including a dispensing magazine for holding respective doses of substance and operable to deliver the respective doses in turn into the reservoir.
12. A system according to any one of claims 8 to 11, wherein the dose of 10 substance generates carbon dioxide on mixing with water.
13. A system according to claim 12, wherein the dose of substance includes sodium bicarbonate.
14. A system according to claim 12, wherein the dose of substance comprises tartaric acid and/or citric acid and at least one salt selected from the group 15 consisting of sodium carbonate, sodium bicarbonate, sodium hydrogen carbonate, potassium carbonate, potassium bicarbonate and potassium hydrogen carbonate.
15. A razor comprising a shaving head including at least one blade, and reservoir for supplying a fluid to be applied to the skin in connection with shaving procedure, and a substance which on mixing with water generates gas and produces 20 the fluid to be applied to the skin, the reservoir being coupled to the shaving head and comprising a chamber refillable with water and at least one inlet and discharge port for filling the chamber with water, delivering into the chamber the substance for mixing with water in the chamber to prepare the fluid to be applied to the skin, and for discharging the prepared fluid from the chamber for application to the skin, the 25 fluid being discharged at or adjacent the shaving head under pressure produced in the chamber by the gas generated when the substance is mixed with the water in the chamber.
16. A razor according to claim 15, wherein the reservoir is a container arranged to form a razor handle.
- 30 17. A razor according to claim 16, wherein the shaving head is supported on the container by a razor neck providing a delivery passage for conducting fluid discharged from the reservoir chamber to the shaving head.

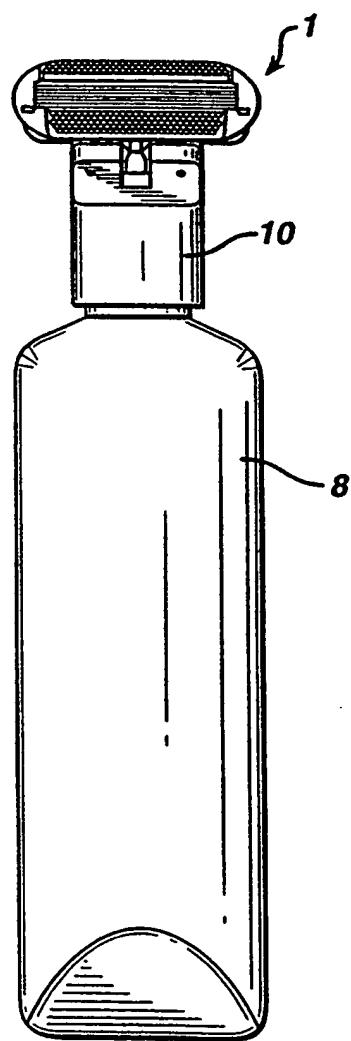
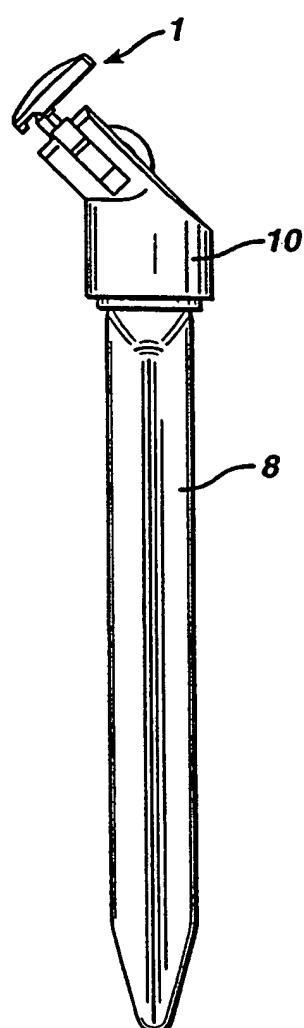
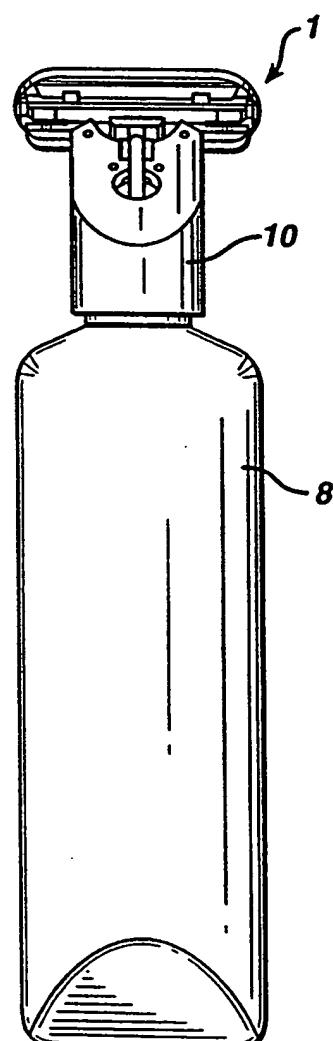
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18. A razor according to claim 17, wherein the shaving head is arranged for the fluid to be discharged at a position ahead of the blade or blades as they move across the skin during shaving.
19. A razor according to claim 18, wherein the fluid is discharged at a guard surface.
20. A razor according to any one of claims 15 to 19, wherein means are provided for delivering a predetermined dose of the substance into the container.
21. A razor according to any one of claims 15 to 20, a predetermined dose of substance is provided in tablet form or contained in a water soluble capsule.
- 10 22. A razor according to any one of claims 15 to 21, including a magazine for holding respective doses of substance and operable to deliver the respective doses in turn into the reservoir chamber.
23. A razor according to any of claims 15 to 22 wherein the substance generates carbon dioxide on being mixed with water.
- 15 24. A razor according to claim 23, wherein the substance comprises sodium bicarbonate.
25. A razor according to claim 23, wherein the substance comprises tartaric acid and/or citric acid and at least one salt selected from the group consisting of sodium carbonate, sodium bicarbonate, sodium hydrogen carbonate, potassium carbonate, potassium bicarbonate, and potassium hydrogen carbonate.
- 20 26. A container for preparing a fluid for application to the skin in connection with a shaving procedure, comprising a refillable reservoir having an inlet for filling the reservoir with water, and a dispensing device operable to deliver a predetermined dose of substance into the water-filled reservoir, the dispensing device being arranged to hold a plurality of doses and to deliver the predetermined doses into the reservoir in turn.
- 25 27. A container according to claim 26, wherein the dispensing device comprises a magazine for holding predetermined doses of substance in tablet form.
28. A container according to claim 26 or 27, wherein each dose of substance is sufficient for one complete shave.
- 30 29. A container according to claim 26, 27 or 28, wherein the substance when mixed with water generates gas for pressurizing the reservoir and produces a

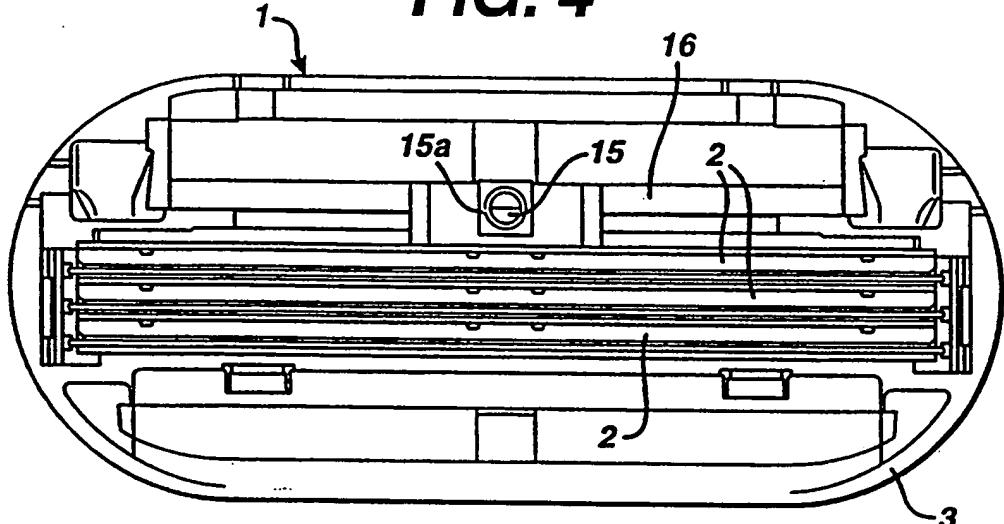
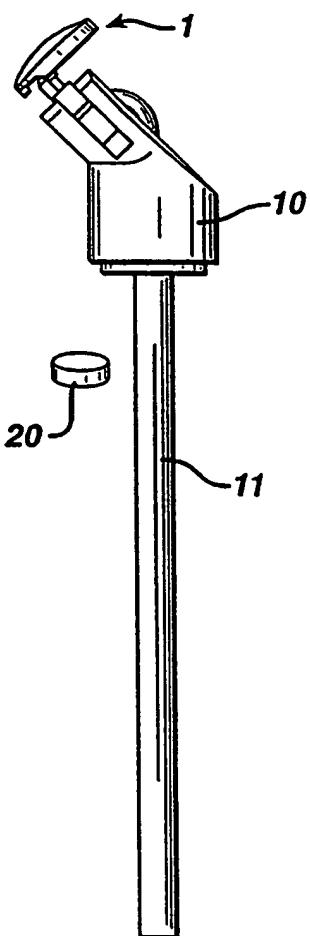
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prepared fluid for application to the skin.

30. A container according to claim 29, wherein the substance generates carbon dioxide on being mixed with water.
31. A container according to claim 30, wherein the substance comprises sodium bicarbonate.
32. A container according to claim 30, wherein the substance comprises tartaric acid and/or citric acid, and at least one salt selected from the group consisting of sodium carbonate, sodium bicarbonate, sodium hydrogen carbonate, potassium carbonate, potassium bicarbonate and potassium hydrogen carbonate.
- 10 33. The invention of any one of the preceding claims, wherein the substance on admixture with water produces a fluid with desired lubricating properties and/or moisturizing properties and/or fragrance and/or chemical hair treatment properties and/or bacterial or medicinal properties, and/or cleansing properties and/or blood coagulation properties.
- 15 34. The invention of any one of the proceeding claims, wherein a valve means is provided for controlling flow of fluid through a delivery passage through which fluid flows from the reservoir.
35. The invention of any one of the preceding claims, wherein a dip tube is provided for discharge of fluid from the reservoir, the dip tube having a valve arrangement permitting discharge of fluid therethrough with the reservoir held either upright or inverted.

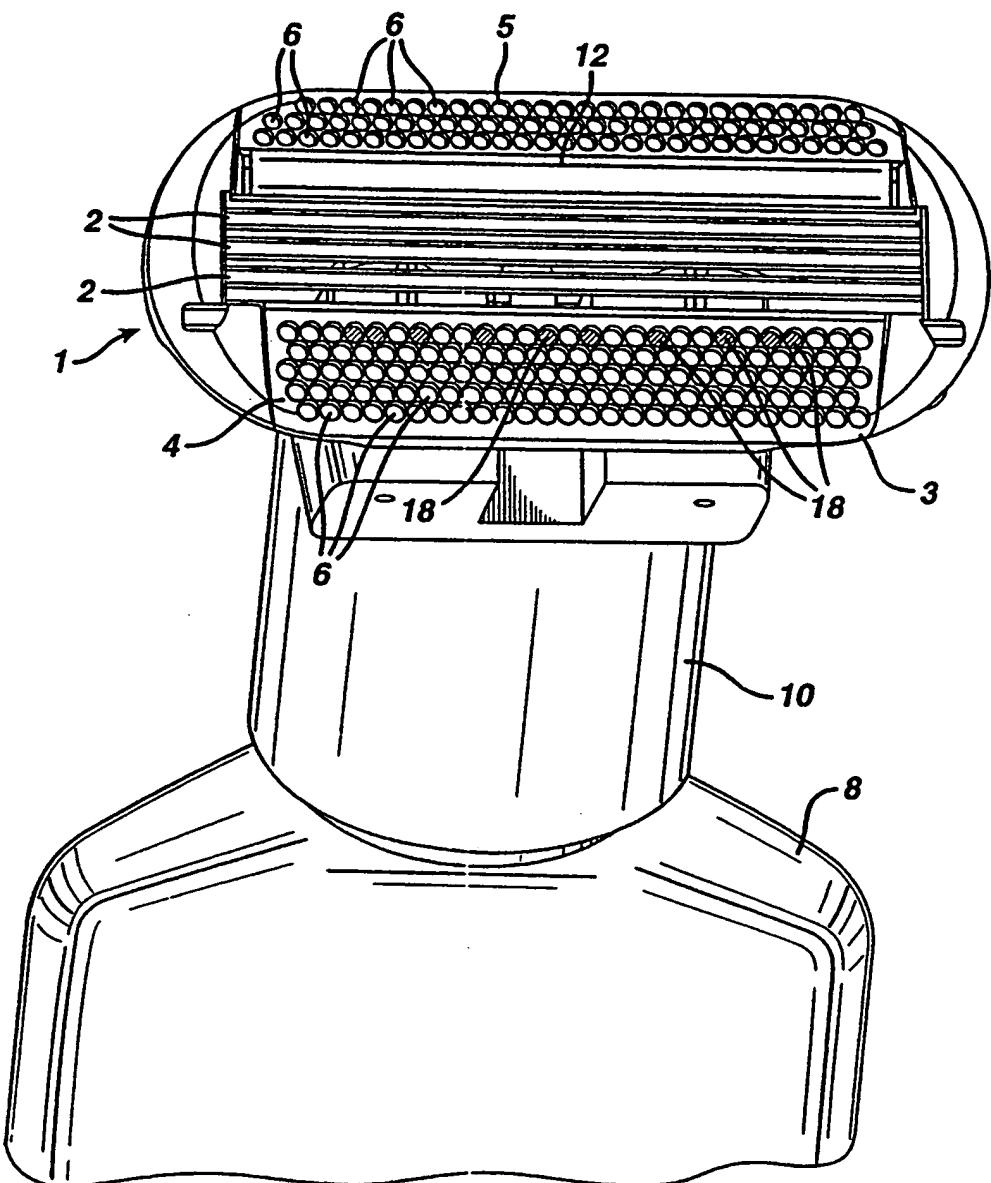
**FIG. 1****FIG. 2****FIG. 3**

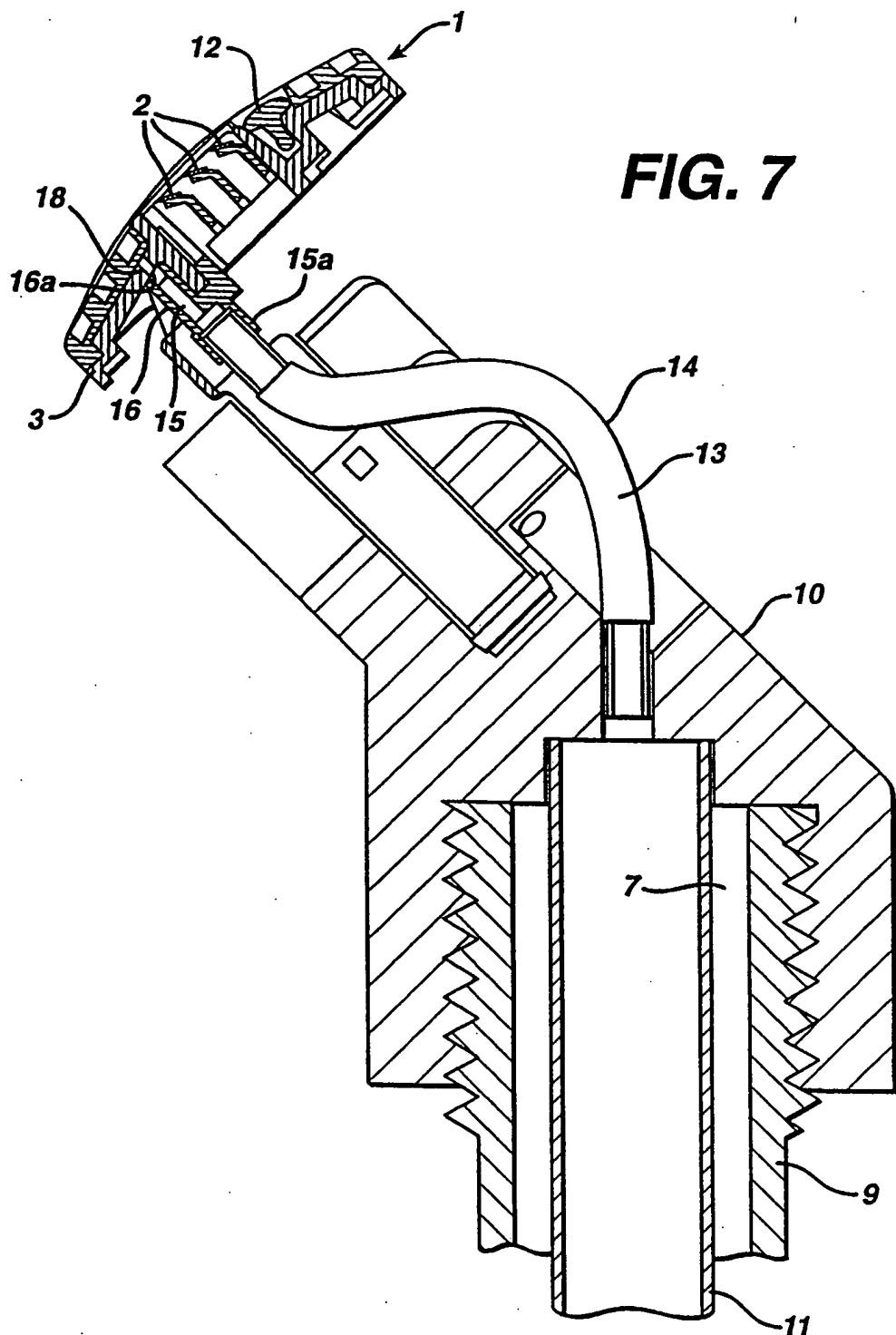
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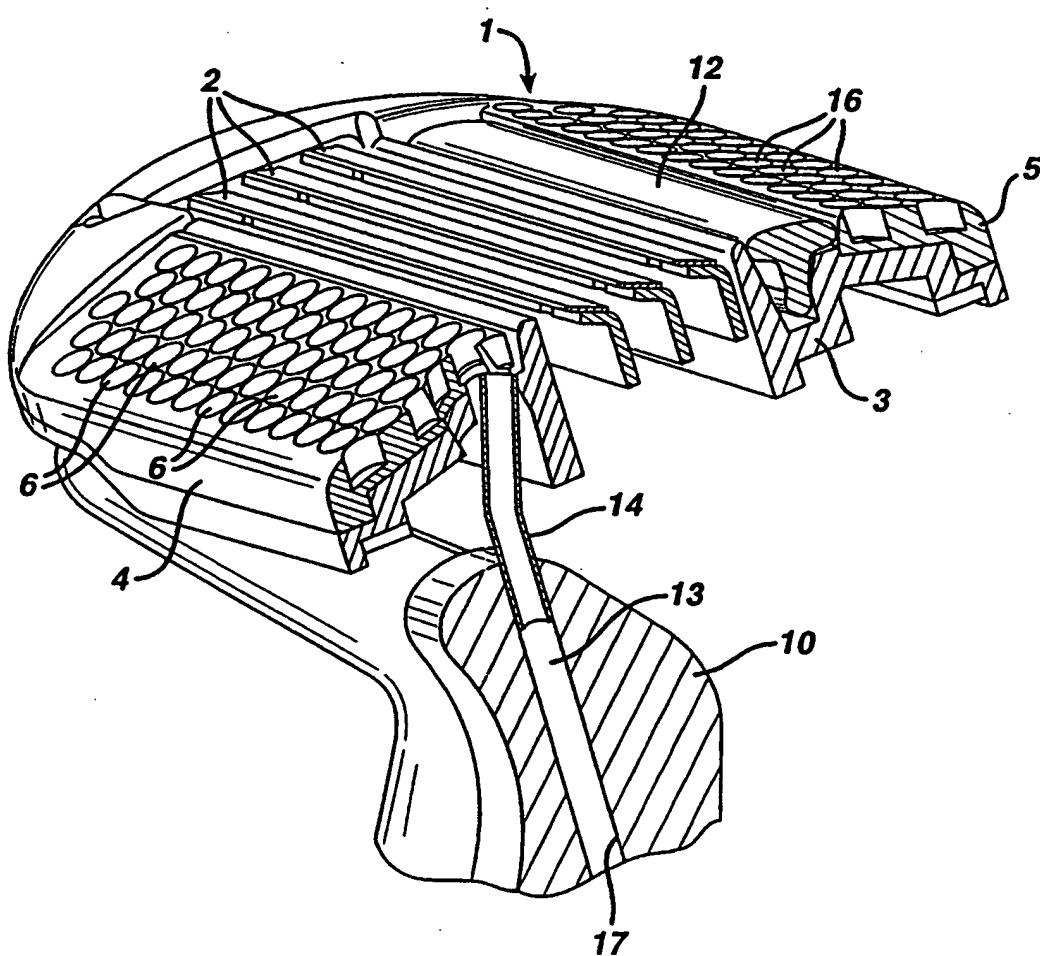
**FIG. 4****FIG. 5**

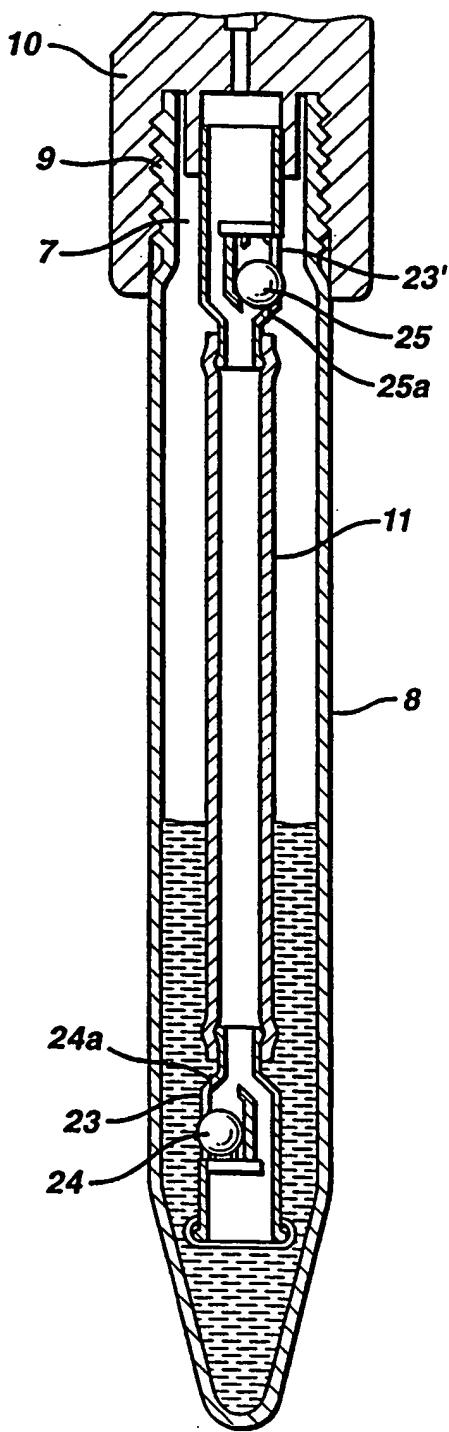
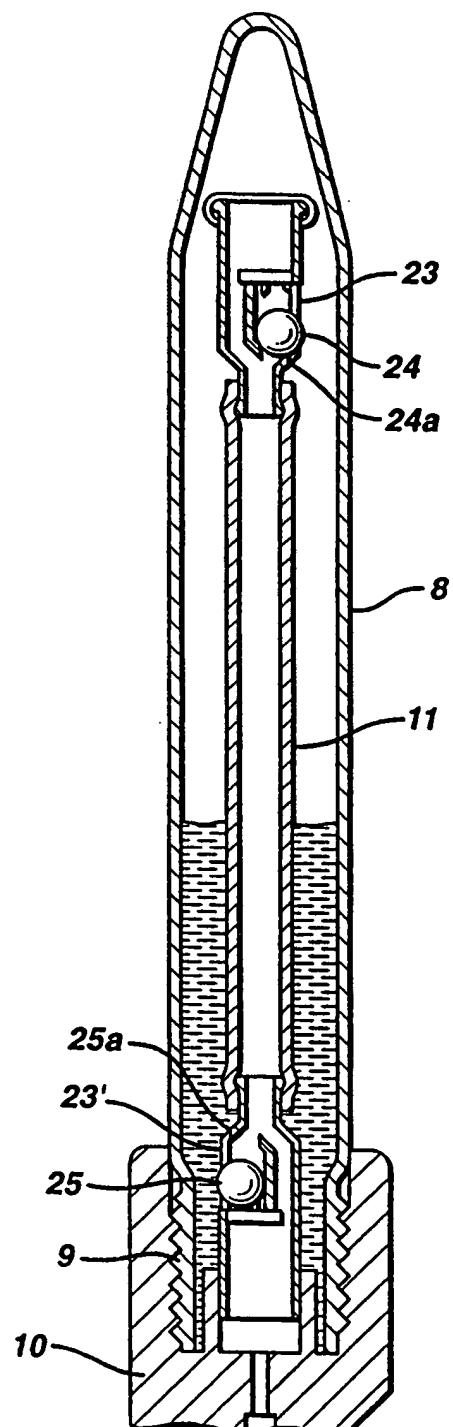
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**FIG. 6**

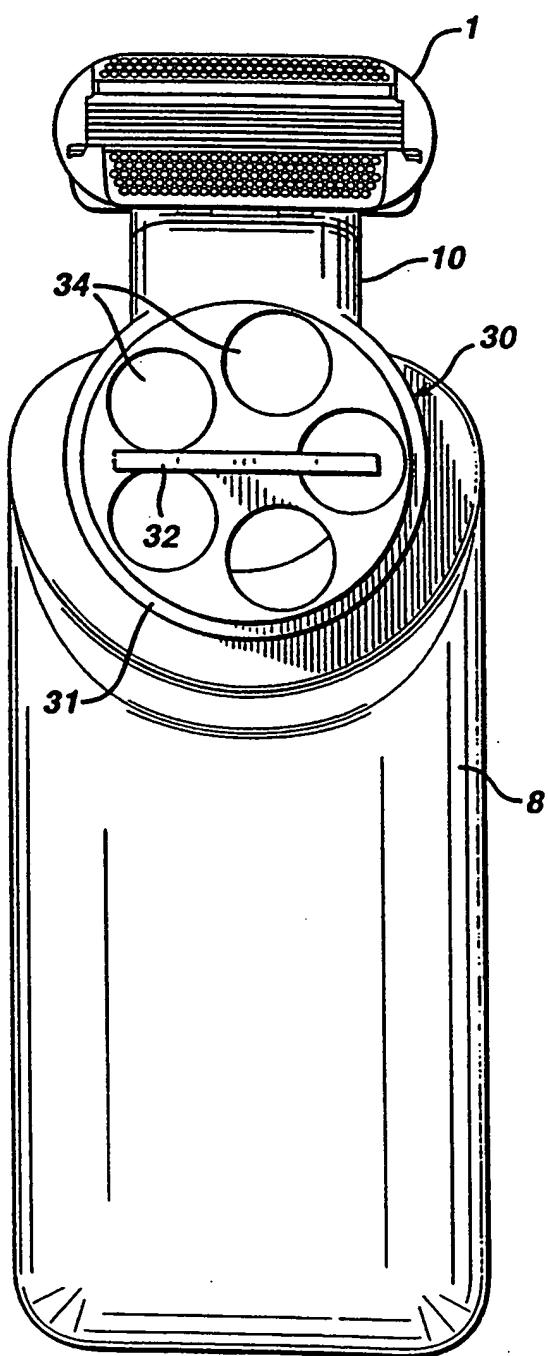
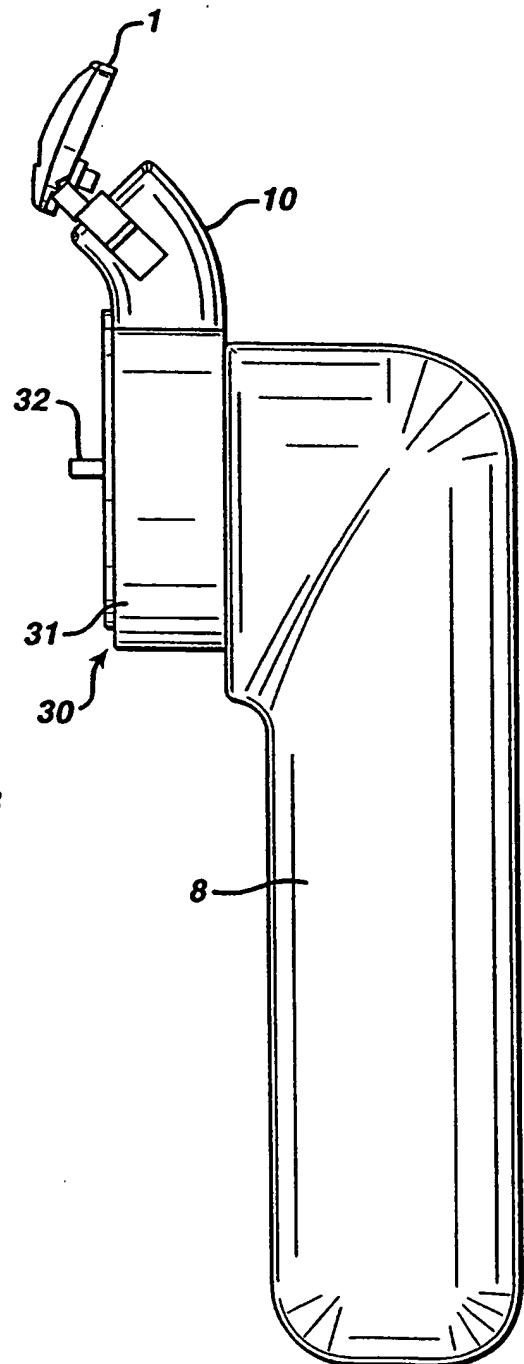


**FIG. 7A**

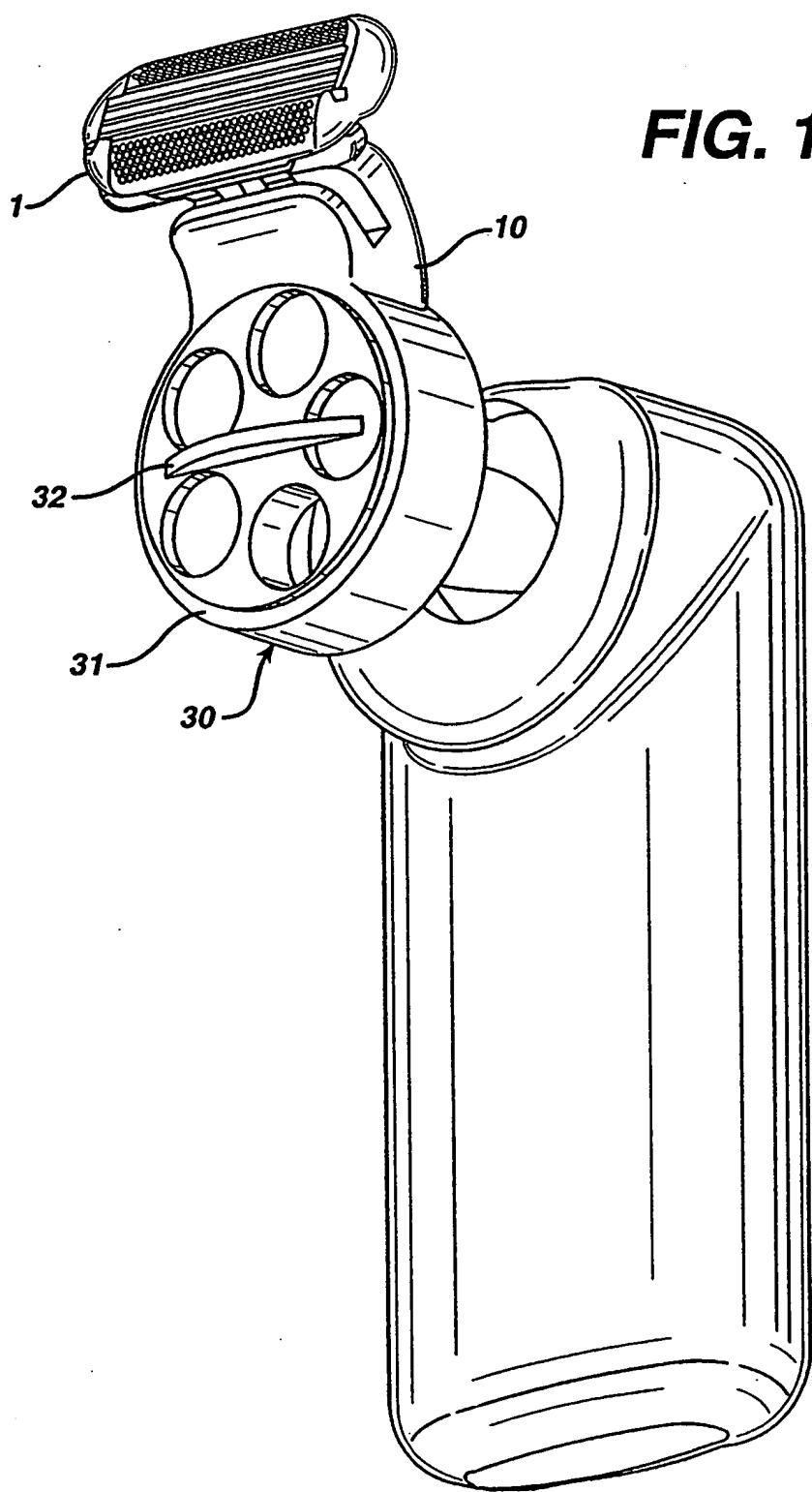
**FIG. 8****FIG. 9**

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**FIG. 10****FIG. 11**

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**FIG. 12**

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/18541

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B26B21/44 B65D83/14

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B26B B65D B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 053 422 A (TENISON) 11 September 1962 (1962-09-11)  column 2, line 6 -column 5, line 4; figures 1-3	1,2, 5-10, 12-14,34
A	---	26
X	US 5 234 140 A (DEMAREST SCOTT W ET AL) 10 August 1993 (1993-08-10)  column 1, line 54 -column 6, line 12; figures 1-12	1,2, 5-10, 12-14,34
A	---	26
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

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\*8\* document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 November 1999	17/11/1999
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  Her1jgers, J

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**INTERNATIONAL SEARCH REPORT**

International Application No PCT/US 99/18541	
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 238 882 A (HARRISON JACK R SR) 16 December 1980 (1980-12-16) cited in the application column 3, line 29 -column 6, line 29; figures 1-5 ----	1,8,15, 26
A	DE 43 35 449 A (FRICK HANS RUEDI ;FREI ALFONS (CH)) 21 April 1994 (1994-04-21) the whole document ----	15

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